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ENVIRONMENT AWARE MESSAGE DELIVERY

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4 FIELD OF THE INVENTION

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6 The present invention is directed to delivering messages for users automatically. It is
7 more specifically directed to environment aware message delivery.

8

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10 BACKGROUND

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12 The Internet has been growing dramatically into a telecommunication network over the
13 world since 1990's. People collect plenty of information by accessing the Internet
14 anywhere, at anytime. Meanwhile, other types of networks, such as cell phone network
15 and pager network, are proliferating rapidly. More and more people will expect a
16 ubiquitous network access which enables them to communicate with anyone, anywhere.

17

18 However, ubiquitous network connectivity for devices does by no means imply
19 continuous delivery of message to anyone anywhere automatically. In fact, more and
20 more people currently possess more than one message device, such as cell phone, home
21 telephone, office telephones, PC and PDA. A person may be in different places from time
22 to time during the day, switching from one message terminal to another. As a result, the
23 person would miss an important call to his home telephone when he is in the office, and
24 may even not get a call to his office when he is away from his desk in the office.

25

26 Message Delivery System (MDS) is a communication infrastructure destined for creation
27 of flexible solutions of message delivery using, a wide range of known transport media.
28 Public Switched Telephone Network (PSTN), Global System for Mobile communication

1 (GSM), e-mail systems, and instant message systems, are all different types of MDS. To
2 solve the above problem, MDS usually provides the necessary message redirection
3 mechanisms so that message is delivered to the called party independent of whatever
4 devices he uses and wherever he is. For example, call-forwarding service is provided in
5 PSTN and GSM.

6

7 There are still some problems in current message redirection mechanisms. Let's take
8 telephone call-forwarding as the example. Call-forwarding is a service that allows to
9 divert incoming calls to another phone number. It offers driver options and the number
10 towards which the calls are diverted can be a cell phone or a telephone number. The
11 service can be used when the user is away from his phone and wants to have calls to him
12 forwarded to a specific place. Obviously, the call-forwarding service provides many
13 advantages, e.g. in reducing radiation from cell phone, saving the power of cell phone,
14 saving money and bringing the user convenience, etc.

15

16 There are many methods to enable a call-forwarding service. If choosing a way of doing it
17 manually, you have to press a series of keys on the cell phone or the telephone to set the
18 call-forwarding option as well as call forwarding phone number. The operation is
19 somewhat awkward for the users, especially for those users who keep roaming frequently
20 from place to place. In addition, you have to know the forwarding phone number in
21 advance or you will be prevented from using the call-forwarding service.

22

23 Now, it is known that some systems, e.g. SIP, provide necessary protocol mechanisms so
24 that systems can automatically provide call-forwarding services. Such a system redirects
25 or uses location service offered by location server to obtain information about a caller's
26 possible location. Location server may use, for example, on-line personal calendars to
27 determine the place where the user would possibly be reached at a certain moment
28 actively as well as the terminal systems available at that place. However, such obtained
29 information might not be true and accurate. For example, people may not define their

1 own calendar at all, or, maybe at some event that could not be anticipated. Besides, the
2 location information could not fully express the information nearby the user's
3 environment. Examples of such environment information include nearby devices'
4 capabilities, available services, and so on. The information is also dynamic along with
5 user's mobility from a location to another location frequently.

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8 **SUMMARY OF THE INVENTION**

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10 Therefore, the present invention provides an environment aware message delivery system
11 and method. The system and method provide a capability of automatic message delivery
12 services based on a users' environment. According to the present invention, a message
13 redirection agent cooperates with a message delivery service manager located in the
14 environment around the user, to discover the message services available in the
15 environment and to set message forwarding options automatically in the background
16 without a user's operation.

17 According to an aspect of the invention, an environment aware message delivery system
18 is provided to deliver message automatically for users. An example of the system
19 comprises a portable message redirection agent carried by a user and a message delivery
20 service manager for managing candidate message terminals to provide message delivery
21 services for the user, wherein when the user moves over to a place, said message
22 redirection agent and said message delivery service manager in the environment around
23 the user co-operate to select a message terminal from the candidate message terminals in
24 the environment as a target message terminal, and request a message redirection entity to
25 redirect the message addressed to the user to said target message terminal.

26

27 According to another aspect of the present invention, an example embodiment of an
28 environment aware message delivery method is provided to deliver message
29 automatically for users, comprising the following steps: making information interaction

1 with a message deliver service manager located in the environment around a user by a
2 portable message redirection agent carried by the user, wherein the interacted information
3 includes the information on available candidate message terminals; selecting a message
4 terminal from said candidate message terminals in the environment as a target message
5 terminal; and, requesting a message redirection entity to redirect the message addressed to
6 the user to said target message terminal.

7
8 According to the present invention, the environment aware message delivery system and
9 method deliver message automatically for users without the users' manual operation . The
10 system and method of the invention are based on more accurate and richer local message
11 delivery devices information than other methods such as location database, calendar, etc.
12
13

14 **BRIEF DESCRIPTION OF THE DRAWINGS**
15

16 These and other advantages, purposes and features of the present invention will become
17 more explicit in connection with the description of the advantageous embodiments with
18 reference to the drawings in which:

19
20 Fig. 1 illustrates a first example embodiment of the environment aware message delivery
21 system according to the present invention;
22

23 Fig. 2 illustrates an example of the message redirection agent (MRA) of Fig. 1;

24
25 Fig. 3 illustrates an example of the message delivery services manager (MDSM) of Fig. 1;

26
27 Fig. 4 shows an example of the environment aware message delivery system for
28 delivering message automatically for users of cell phones based on the system shown in
29 Fig. 1;

1
2 Fig. 5 is a chart of the processing steps of the environment aware message system of Fig.4
3 for delivering message automatically for users according to the present invention;
4
5 Fig. 6 shows an example of the system for automatically delivering message for the users
6 of telephones based on the system of Fig. 1;
7
8 Fig. 7 illustrates a second example embodiment of the environment aware message
9 delivery system according to the present invention;
10
11 Fig. 8 illustrates an example of the message redirection agent (MRA) of Fig. 7;
12
13 Fig. 9 illustrates an example of the message delivery services manager (MDSM) of Fig. 7;
14
15 Fig. 10 illustrates a third example embodiment of the environment aware message
16 delivery system according to the present invention;
17
18 Fig. 11 illustrates an example of the message redirection agent (MRA) of Fig. 10;
19
20 Fig. 12 illustrates an example of the message delivery services manager (MDSM) of Fig.
21 10;
22
23 Fig. 13 illustrates a fourth example embodiment of the environment aware message
24 delivery system according to the present invention;
25
26 Fig. 14 illustrates an example of the message redirection agent (MRA) of Fig. 13; and
27
28 Fig. 15 illustrates an example of the message delivery services manager (MDSM) of
29 Fig.13.

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3 **DESCRIPTION OF THE INVENTION**

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5 The present invention provides environment aware message delivery systems, apparatus
6 and methods. The systems and methods provide a capability of automatic message
7 delivery services based on a users environment. A message redirection agent cooperates
8 with a message delivery service manager located in the environment around the user, to
9 discover the message services available in the environment, and to set message
10 forwarding options automatically in the background without a user's operation. The
11 present system and method make full use of the existing message redirection mechanisms
12 in more flexible manners.

13

14 An environment aware message delivery system is provided to deliver message
15 automatically for users. In an example embodiment, the system comprises a portable
16 message redirection agent carried by a user, and a message delivery service manager for
17 managing candidate message terminals to provide message delivery services for the user.

18 When the user moves to a new place, the message redirection agent and the message
19 delivery service manager, in the environment around the user, co-operate to select a
20 message terminal from the candidate message terminals in the environment as a target
21 message terminal, and request a message redirection entity to redirect the message
22 addressed to the user to said target message terminal.

23

24 An example of an environment aware message delivery method is provided to deliver
25 message automatically for users. The method comprising the following steps: making
26 information interaction with a message deliver service manager located in the
27 environment around a user by a portable message redirection agent carried by the user,
28 wherein the interacted information includes the information on available candidate
29 message terminals; selecting a message terminal from said candidate message terminals

1 in the environment as a target message terminal; and, requesting a message redirection
2 entity to redirect the message addressed to the user to said target message terminal.

3

4 According to the present invention, the environment aware message delivery system and
5 method deliver message automatically for users without the users' operation manually.
6 The system and method of the invention are based on more accurate and richer local
7 message delivery devices information than other methods such as location database,
8 calendar, etc.

9

10 Advantageous embodiments of the invention are described with reference to the attached
11 drawings as follows. For the sake of completeness, technical terms as well as some
12 abbreviations adopted in the description are explained first, as follows:

13

14 Message: any voice or literal, verbal or written contents sent from one entity to
15 another;

16

17 Originator: the calling user who wishes to communicate with others;

18

19 Recipient: the callee whom the originator would like to be ultimately connected
20 to;

21

22 Message Redirection Entity (MRE): the functional entity that provides the
23 message redirection capability, which can be, e.g. the Mobile Switch Center
24 (MSC) or Private Branch eXchange (PBX); etc.

25

26 Served Message Terminal (SMT): the terminal to which the message redirection
27 service is provided; the message sent to the served message terminal should be
28 handled by the message redirection entity;

29

1 Target Message Terminal (TMT): the terminal to which the message is redirected
2 as a result of redirection, which can be, e. g., a home telephone, an office
3 telephone, or a cell phone, voice mailbox, etc.;

4

5 Caller Terminal (CT): the original message terminal in a communication that is
6 subject to redirection;

7

8 Message Redirection Agent (MRA): the agent that discovers the available
9 call-forwarding services in local environment and optionally may set
10 call-forwarding options on behalf of the associated served phone terminal;

11

12 Message Delivery Services Manager (MDSM): the service manager that provides
13 the available message delivery services to the nearby users; and

14

15 Candidate Message Terminal (CMT): the terminal that is managed by the message
16 delivery services manager.

17

18 A first embodiment of an environment aware message delivery system of the invention is
19 shown in Figure 1. The system comprises a portable message redirection agent MRA
20 carried by a user and a message delivery services manager MDSM for managing the
21 candidate message terminals CMTs to provide the user with message delivery services.
22 To better understand the processing of the system, a message redirection entity MRE
23 providing the message redirection capability, a plurality of candidate message terminals
24 CMTs located surrounding the environment and a short range wireless communication
25 network are also illustrated in Figure 1.

26

27 While in an advantageous embodiment of the invention the portable message redirection
28 agent MRA carried by the user cooperates with the message delivery services manager
29 MDSM in the local environment through the short range wireless communication

1 network, it is obvious to those skilled in the art that other communication links, e. g. USB
2 interface, may be adopted for the cooperation between the portable message redirection
3 agent MRA and the message delivery services manager MDSM.

4

5 In the embodiment shown in Figure 1, MRE can be any entity that provides message
6 redirection capability, for example MSC or PBX or the like. Depending on the type of
7 message, the CMT may be cell phones, telephones, PDA, personal computers PCs,
8 facsimile machines, printers and so on. The short range wireless communication network
9 may be Bluetooth, IrDA and so on. As shown in Figure 1, the message from the caller
10 terminal CT is sent directly to the serviced message terminal SMT before the message
11 redirection is conducted. By using the message automatically delivery system of the
12 present invention, the message redirection agent MRA carried by the user cooperates with
13 the message delivery services manager MDSM in local environment through the short
14 range wireless network, when he/she moves over to a place, selects a message terminal
15 from the candidate message terminals (CMTs) in the local environment as a target
16 message terminal TMT and requests the message redirection entity MRE to redirect the
17 message addressed to the user to the target message terminal TMT. In the system shown
18 in Figure 1, every MRA is associated with a SMT and the MDSM manages more than
19 one CMTs. The composition of the MRA and the MDSM will be described in detail with
20 reference to the drawings.

21

22 As shown in Figure 2, the MRA is composed of message redirection services discoverer,
23 message redirection manager and message redirection requester. Wherein the message
24 redirection services discoverer is responsible for soliciting MDSM on demand and
25 receiving the message delivery services information from the MDSM.

26

27 The message redirection manager is responsible for managing and maintaining a message
28 redirection service list, configuring the message redirection policy and selecting the target
29 message terminal. Each entry in the service list might contain two fields: the target

1 message terminal ID and the message delivery services manager ID. MRA will update the
2 message redirection service list according to the received service information. When the
3 wireless link from the MRA to MDSM A is broken, all entries whose message delivery
4 service manager ID field is equal to A will be deleted from the service list.

5

6 Users could prearrange some special rules to provide more flexibility. For example, the
7 user might prefer to choose particularly some phones as target message terminals and the
8 message redirection agent would give a higher priority to these chosen phone numbers. In
9 addition, the target message terminal may be determined also in accordance with the type
10 of the message or the situation of the candidate message terminals in the local
11 environment. The message redirection requester is responsible for requesting message
12 redirection service from the message redirection entity. The operation can be done
13 according to the service specification for the related message system. For example, for
14 GSM cell phones engaged with China Mobile, there are four call-forwarding options,
15 which are depicted in Table 1.

16

17

18

19

Table 1

20

21

Call-forwarding options	Operation	Press
Phone off/ out of range	Activate	**62*<phone_number>#Send
	Cancel	##62#
	Check status	*#62#
Ring no answer	Activate	**61<phone_number>#Send
	Cancel	##61#
	Check status	*#61#
Phone busy	Activate	**67<phone_number>#Send
	Cancel	##67#
	Check status	*#67#
Unconditional	Activate	**21<phone_number>#Send
	Cancel	##21#
	Check status	*#21#

1 The message redirection requester commands the associated served message terminal
2 SMT to send a series of key operations to complete the call-forwarding task. For
3 telephones, the call-forwarding instruction and signals of one PBX are different from that
4 of the others, and the PBXs will be treated individually by the message redirection
5 requester.

6

7 The components of the message delivery services manager MDSM of Figure 1 are
8 described with reference to Figure 3 as follows. In the system as shown in Figure 1, the
9 MDSM that manages a plurality of CMTs is composed of a service request handler, a
10 service availability detector, a message delivery service configurator, as well as a service
11 advertiser. The service request handler is responsible for authenticating the MRAs,
12 sending on-demand service information to the requesting MRAs. The service
13 availability detector is responsible for detecting the status of the message terminals
14 (including the target message terminal TMT and candidate message terminals CMTs)
15 managed by the MDSM and for updating the message delivery service list according to
16 the status of these terminals. The message delivery service configurator is responsible for
17 configuring the available message delivery services, authorizing which MRA can access
18 these services. The service advertiser is responsible for periodically sending service
19 information to nearby MRAs. The information includes the capabilities of available
20 message redirection devices, available message redirection services, the address of the
21 manager and so on. As well-known to the technicians in the art, the service advertiser is
22 optional with respect to the system of Figure 1.

23

24 Taking the call-forwarding of cell phones and telephones respectively as examples, an
25 implementation of the system of Fig 1 is presented herewith. As an example, Figure 4
26 illustrates an implementation of the system of Figure 1 with regard to cell phone
27 call-forwarding. In this example, a user with a cell phone is roaming around different
28 places. In the implementation shown in Figure 4, the MRA runs in the cell phone or PAD.
29 Subsequently, the discussion will be addressed to review how the environment aware

1 message delivery system according to the first embodiment of the present invention
2 works. The processing steps of the system are shown in Figure 5.

3

4 In Step 1: the system administrator configures the phone terminals to be managed
5 by the MDSM and sets the control policy to define the users, priorities and so on.

6

7 In Step 2: when the user is close to the MDSM, the MRA running in the cell
8 phone or PDA discovers the message delivery services available in local
9 environment through Bluetooth Service Discovery Protocol. After the user is
10 authenticated, the MRA gains the information of available message delivery
11 services such as call-forwarding phone numbers. A phone terminal is selected as
12 the target message terminal TMT based on the user's preference.

13

14 In Step 3: the MRA commands the cell phone to request the MSC to do
15 call-forwarding operation.

16

17 In Step 4: when a caller terminal CT originates a call to the cell phone, the call
18 will be forwarded to the target message terminal TMT.

19

20 In Step 5: when the user is going far away from the MDSM, the Bluetooth stack
21 notifies the MRA that the Bluetooth link with the MDSM is lost. The MRA
22 checks if there is available call-forwarding phone numbers. If not, the MRA will
23 communicate the MSC to cancel the call-forwarding service.

24

25 As another example, Figure 6 illustrates an implementation of the system of Figure 1 with
26 regard to telephone call-forwarding condition. The differences between the
27 implementation of Figure 6 and that of Figure 4 lie in two points. One is that the MRA is
28 running in a Bluetooth enabled badge carried by the user. Another is that the message
29 redirection entity is PBX which is requested by the MRA to redirect all calls that are

1 being addressed to the user to the target message terminal TMT.

2

3 The environment aware message delivery system according to the first embodiment of the
4 present invention, the implementation with regard to cell phones and telephones, and the
5 processing steps of the system have been described above in detail with reference to
6 Figure 1 to Figure 6. It is obvious that Figure 5 also provides a flowchart of an
7 embodiment of an environment aware message delivery method for automatically
8 delivering message for users according to the present invention.

9

10 According to the circumstances that whether or not the message delivery service manager
11 MDSM is shared by a plurality of candidate message terminals in the surrounding
12 environment, and whether the request for message redirection service is made by the
13 message redirection agent MRA to the message redirection entity MRE or it is made by
14 the message delivery service manager MDSM to the message redirection entity, there are
15 some alternative embodiments for the present invention. The followings are brief
16 introductions of some of such alternative embodiments.

17

18 Figure 7 illustrates a second embodiment of the environment aware message delivery
19 system of the present invention which delivers message for users automatically. The
20 differences between the system of Figure 7 and that of Figure 1 lie in that in the system of
21 Figure 7 the MDSM requests the MRE for message redirection service. In this
22 embodiment, as shown in Figure 9, the message delivery service manager MDSM
23 includes also a message redirection requester. With such a configuration, if the target
24 message terminal TMT is selected by the MDSM, as shown in Figure 8A, the MRA can
25 be simplified only to be composed of a message redirection service discoverer.
26 Furthermore, the message redirection service discoverer is used only for sending service
27 request to MDSM and there is no need to use it to receive the service information from
28 the MDSM. Meanwhile, there is no need for the MDSM to send service information to
29 the MRA. If the target message terminal TMT is selected by the MRA, as shown in

1 Figure 8B, the MRA comprises a message redirection service discoverer and a message
2 redirection manager.

3

4 It would be by no means difficult for one skilled in the art, based on the above teaching,
5 to gain the implementations of the second embodiment of the environment aware
6 message delivery system of the invention as shown in Figure 7 with regard to the cell
7 phone and telephone call-forwarding as well as the processing steps of the system. For the
8 sake of conciseness, a detailed description thereabout is omitted hereafter.

9

10 Figure 10 illustrates a third embodiment of the environment aware message delivery
11 system of the present invention which delivers message for users automatically. As
12 shown in Figure 10, the system comprises a plurality of MDSMs that run on the message
13 terminals respectively, wherein the message terminals may be intelligent terminals that
14 can possibly conduct short range wireless communication with the MRA and are able to
15 process the request from the MRA. Referring to Figure 11 and Figure 12, a simplification
16 is made so that the MDSM comprises merely of a service request handler and a service
17 advertiser (optionally) and the MRA comprises a message redirection discoverer, a
18 message redirection manager and a message redirection requester.

19

20 It would be by no means difficult for those skilled in the art, based on the above contents,
21 to gain the implementations of the third embodiment of the environment aware message
22 delivery system of the invention as shown in Figure 10, with regard to the cell phone and
23 telephone call-forwarding as well as the processing steps of the system. For the sake of
24 conciseness, a detailed description thereabout is omitted hereafter.

25

26 Figure 13 illustrates a fourth embodiment of the environment aware message delivery
27 system of the present invention which delivers message for users automatically. The
28 differences between the system of Figure 13 and that of Figure 10 lie in that in the system
29 of Fig.13 the target message terminal TMT requests the MRE for message redirection

1 service. Figure 14 and Figure 15 show the components of the MRA and the MDSM under
2 the architecture of Figure 13. The MRA comprises a message redirection discoverer and a
3 message redirection manager and the MDSM comprises a service request handler, a
4 message redirection requester and a service advertiser (optionally).

5

6 It would be by no means difficult for those skilled in the art, based on the above contents,
7 to gain the implementations of the fourth embodiment of the environment aware message
8 delivery system of the invention as shown in Figure 13 with regard to the cell phone and
9 telephone call-forwarding as well as the processing steps of the system. For the sake of
10 conciseness, a detailed description thereabout is omitted hereafter.

11

12 The above provides in detail, with reference to the drawings, the descriptions of the
13 advantageous embodiments of the environment aware system and the method according
14 to the present invention for delivering message automatically for users.

15

16 While the invention has been described by way of advantageous embodiments, the
17 embodiments may be modified within the scope of the affixed claims without apart from
18 the substantive spirit of the invention. It is obvious to the ordinary technicians of the art
19 that the present invention possesses other examples and embodiments in spite that the
20 above discussion about the advantageous embodiments of the invention are given on the
21 examples of delivering message for cell phone users and fixed phone users.

22

23

24

25 Variations described for the present invention can be realized in any combination
26 desirable for each particular application. Thus particular limitations, and/or embodiment
27 enhancements described herein, which may have particular advantages to the particular
28 application need not be used for all applications. Also, not all limitations need be
29 implemented in methods, systems and/or apparatus including one or more concepts of the

1 present invention.

2

3 The present invention can be realized in hardware, software, or a combination of
4 hardware and software. A visualization tool according to the present invention can be
5 realized in a centralized fashion in one computer system, or in a distributed fashion where
6 different elements are spread across several interconnected computer systems. Any kind
7 of computer system - or other apparatus adapted for carrying out the methods and/or
8 functions described herein - is suitable. A typical combination of hardware and software
9 could be a general purpose computer system with a computer program that, when being
10 loaded and executed, controls the computer system such that it carries out the methods
11 described herein. The present invention can also be embedded in a computer program
12 product, which comprises all the features enabling the implementation of the methods
13 described herein, and which - when loaded in a computer system - is able to carry out
14 these methods.

15

16 Computer program means or computer program in the present context include any
17 expression, in any language, code or notation, of a set of instructions intended to cause a
18 system having an information processing capability to perform a particular function
19 either directly or after conversion to another language, code or notation, and/or
20 reproduction in a different material form.

21

22 Thus the invention includes an article of manufacture which comprises a computer usable
23 medium having computer readable program code means embodied therein for causing a
24 function described above. The computer readable program code means in the article of
25 manufacture comprises computer readable program code means for causing a computer to
26 effect the steps of a method of this invention. Similarly, the present invention may be
27 implemented as a computer program product comprising a computer usable medium
28 having computer readable program code means embodied therein for causing a function
29 described above. The computer readable program code means in the computer program

1 product comprising computer readable program code means for causing a computer to
2 effect one or more functions of this invention. Furthermore, the present invention may be
3 implemented as a program storage device readable by machine, tangibly embodying a
4 program of instructions executable by the machine to perform method steps for causing
5 one or more functions of this invention.

6

7 It is noted that the foregoing has outlined some of the more pertinent objects and
8 embodiments of the present invention. This invention may be used for many
9 applications. Thus, although the description is made for particular arrangements and
10 methods, the intent and concept of the invention is suitable and applicable to other
11 arrangements and applications. It will be clear to those skilled in the art that
12 modifications to the disclosed embodiments can be effected without departing from the
13 spirit and scope of the invention. The described embodiments ought to be construed to
14 be merely illustrative of some of the more prominent features and applications of the
15 invention. Other beneficial results can be realized by applying the disclosed invention in
16 a different manner or modifying the invention in ways known to those familiar with the
17 art.